

REMARKS/ARGUMENTS

Claims 1, 3-8, 11, 12 and 17-21 are active in the case. Reconsideration is respectfully requested.

The present invention relates to a process of preparing a radiation-curable urethane (meth)acrylate.

Claim Amendment

Claims 1 and 19 have been amended in step (i) of each claim by amending the term “acrylic acid” to “(meth)acrylic acid” in light of the fact that (meth)acrylic acid is reactant (B) in the first step (a) of partial esterification of the acid compound. The language of Claims 1 and 19 is now internally consistent with regard to the reactant (meth)acrylic acid. The amendment does not introduce new matter into the case. Entry of the amendments is respectfully requested.

Claim Rejection, 35 USC 112, Second Paragraph

Applicants do not concur that there is an internal inconsistency in the language of Claim 1 with regard to the (M) component of the reaction of step (I) of the claimed process. The fact that the minimum amount for the quantity of component (M) used is 0 mol obviously means that the presence of component (M) is optional. It may or may not be present in the reaction mixture of step (I). Furthermore, since component (M) may be present in the reaction mixture of step (I) because of the maximum limit of 0.2 mol of the claimed range, in the case of the presence of two or more component (M) compounds in the reaction mixture, which is clearly permissible, the phrase “at least one” of the second and third lines describing step (I) of Claim 1 is not indefinite. When component (M) is present, it may be present as one compound or as two or more compounds. Thus, the description of the amount

of component (M) is not internally inconsistent. Withdrawal of the ground of rejection is respectfully requested.

Claim Rejection, 35 USC 103

Claims 1, 3-8, 11, 12 and 14-16 stand rejected under 35 USC 103(a) as obvious over Niehaus et al, U.S. Patent 4,380,604 in view of Lokai et al, U.S. Patent 6,319,983 and further in view of Paulus et al, '991. This ground of rejection is respectfully traversed.

The Examiner states that Neuhaus et al patent describes the preparation of a radiation curable urethane acrylate. The urethane acrylate is formed by the reaction of a combination of OH group containing compounds which are (B) a hydroxyl functional polyester acrylate and a hydroxyalkyl acrylate (C) with a polyisocyanate (see the paragraph bridging columns 3 and 4). The urethane material produced functions as a binder in the radiation curable product of the patent. (The Examiner fails to mention that component (B) is an OH group containing ethylenically unsaturated partial ester.) However, the Examiner in his discussion of Neuhaus et al in paragraphs 2 and 3, although accurately noting that the reference does not provide a teaching of the use of an epoxide somewhere in the process of the patent, gives this lack of presence of an epoxide reactant short shrift in his remarks. In fact, this lack of a specific teaching of an epoxide is a major deficiency of the reference.

The Examiner refers to the Lokai et al patent as providing a teaching of using an epoxide in a reaction with a hydroxyl group containing (meth)acrylate compound to justify the suggested obviousness of using the epoxide in the process of Neuhaus et al. However, the chemical environment of the process of reacting an epoxide in Lokai et al is entirely different from the chemical environment in which Neuhaus et al employs a polyisocyanate reactant to form the binder of the reference, and on this basis applicants are not of the opinion that one of skill in the art would find it obvious to combine the teachings of the two patents into a unified

whole. That is, Neuhaus et al discloses a reaction in which the isocyanate groups of the polyisocyanate react with the hydroxyl groups of the ethylenically unsaturated partial ester material, as well as with the hydroxyl groups of the hydroxyalkyl acrylate compound. Thus, what is taught is a mixed product in which isocyanate groups react with available hydroxyl groups in both hydroxyl group containing reactants to form molecules with urethane linkages between the polyisocyanate residue and the hydroxyl groups of the two different compound reactants. The product material therefore contains sites of ethylenic unsaturation which, when exposed to actinic radiation, react to form a hardened product. In Lokai et al no such reaction sequence to ultimate product is described. Rather, Lokai et al does not show the reaction with a polyisocyanate and at least one hydroxyl group containing compound, but rather the direct reaction of at least one epoxy-functional compound with the ester product of at least one hydroxyl-containing compound with (meth)acrylic acid (after removal of unreacted (meth)acrylic acid). Thus, an intermediate material is formed which contains no urethane linkages, but rather ether linkages between the epoxy compound residue and the ester compound of the first stage of reaction. The hydroxyl group on the remaining carbon atom of the epoxy compound residue of the molecule is then reacted with the isocyanate groups of the isocyanate compound of step (d), thereby forming an adduct based on linking urethane radicals. However, it is abundantly clear that sequence of reactions described in column 2 of the Lokai et al patent is entirely different from the reaction sequence described in Neuhaus et al. Accordingly, the radiation curable binder taught by Lokai et al is entirely different compositionally from the binder taught by Neuhaus et al. It is therefore not clear at all why one of skill in the art would be led by the two patents to employ an epoxide reactant first as a reactant with the hydroxyalkyl (meth)acrylate and the OH group containing, ethylenically unsaturated partial ester, and then react the epoxidized intermediate with a polyisocyanate.

The Examiner states in paragraph 6 of the Office Action that *it would have been obvious to include applicants step k) in Neuhaus et al since it is disclosed as being useful in producing analogous acrylates*. Applicants do not concur with this conclusion. In the first place, in order to make a case of obviousness on the record, it is necessary for the two prior art references to provide one of skill in the art with motivation to combine the relevant teachings of the prior art and to arrive at the present invention as claimed without ever having benefit of a knowledge of the present invention. In the present case, why would one of skill find it obvious and/or needful to first react the mixture of reactants (A) and (B) of Neuhaus et al with an epoxide to prepare a product devoid of urethane linking groups, when the very objective of the patent is to prepare a binder material which features in the basic molecular structure thereof, the presence of urethane linkages? Moreover, there is no teaching or suggestion in Neuhaus et al, as seen above, of forming an initial reaction product in which the linkage (ether linkages) of epoxide residues with residues from hydroxyalkyl acrylates and OH group containing partial esters occurs before a reaction product is prepared that contains urethane linkages. Simply stated, the combined patents do not suggest the invention as claimed.

Applicants maintain their position with respect to the Paulus et al patent in that its disclosure a method of preparing (meth)acrylates by reaction of (meth)acrylic acid with alcohols that may be alkoxylated is of ancillary interest to the present invention.

In view of the comments above, withdrawal of the outstanding ground of invention is respectfully requested.

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It is believed that the application is in proper condition for allowance. Early notice to this effect is earnestly solicited.

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